

oxygen rich atmosphere followed by treating the sidewalls with a nitrogen compound. Further, claim 23 is amended to claim the gap filling insulating material being high temperature annealed to cause said gap fill layer to become more dense.

5           While Gardner et al. does in fact disclose a nitrogen doped liner grown on the sidewalls of a shallow trench. The liner of Gardner et al. is grown by first growing the nitride and then exposing the liner to an atmosphere of oxygen to form the oxynitride. The liner has a gradient of nitrogen that decreases from the floor and sidewalls of the trench to the exposed atmosphere. The liner of this invention  
10   could not have such a gradient with the nitrogen compounds being deposited first to grow the silicon nitride and then the oxygen compounds to grow the oxynitrides. There is no teaching in Gardner et al. to this type of construction of the insulating liner. Further, the time for growth of the liner as taught in Gardner is from 30  
15   second to 120 seconds for the nitride growth and 1 minute to 3 minutes for the oxygen atmosphere for the growth of the silicon oxynitride. Whereas, the liner of this invention is exposed to the oxygen compounds for 60 to 120 minutes and the nitrogen compounds for 30 minutes to 90 minutes. As is known in the art, the amount of time exposed would prevent the gradient as taught in Gardner et al.

          While Gardner et al. does describe the trench dielectric to act as the gap  
20   filling insulating material of the trench, there is no teaching in Garder et al. for high temperature annealing the gap filling insulating material to cause the gap filling insulating material to become more dense.

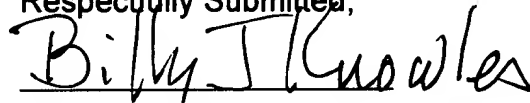
Claims 24 – 26 are amended to insure proper dependency.

Applicant understands that Examiner's **FINAL** position re this application and believes that the claims are in condition for allowance.

Allowance of all Claims is requested.

It is requested that should the Examiner Pompey not find that the Claims  
5 are now allowable, that the undersigned be called at (845) 452-5863 to overcome any problems preventing allowance.

Respectfully Submitted,



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# VERSION WITH MARKINGS TO SHOW CHANGES MADE

## In the Claims:

The Claims are amended as follows:

- 1    23.    An integrated circuit structure formed at the surface of a substrate,  
2           comprising:  
3                  a plurality of shallow trenches formed in the surface of the substrate;  
4                  a nitrogen doped insulating liner grown on sidewalls of the shallow  
5                  trenches by treating said sidewalls with an oxygen rich  
6                  atmosphere followed with treating said sidewalls with a nitrogen  
7                  compound;  
8                  a gap filling insulating material filling the shallow trenches level with  
9                  the surface of the substrate said gap filling insulating material  
10                 being high temperature annealed to cause said gap filling  
11                 insulating material to become more dense; and  
12                 a plurality transistors formed in the surface of the substrate in  
13                 regions between said shallow trenches, wherein each of said  
14                 transistors include a source and a drain formed by diffusing an  
15                 impurity species into the surface of said substrate, wherein said  
16                 nitrogen doped insulating liner acts as a stop to prevent said  
17                 impurity species from diffusing into said substrate from said gap  
18                 filling insulating material.

- 1 24. The integrated circuit structure of claim 23 wherein the nitrogen-doped  
2 insulating liner is formed by treating the sidewalls with an oxygen-rich  
3 atmosphere followed by asaid nitrogen compound is selected from the  
4 group of nitrogen compounds consisting of nitrogen ( $N_2$ ) gas, ammonia  
5 ( $NH_3$ ), nitric oxide (NO), and nitrous oxide ( $N_2O$ ).
- 1 25. The integrated circuit structure of claim 24 23 wherein the oxygen rich  
2 atmosphere is selected from the atmospheres consisting of steam and  
3 oxygen gas.
- 1 26. The integrated circuit structure of claim 24 23 wherein the treating of the  
2 sidewalls of the shallow trenches with the oxygen rich atmosphere of the  
3 shallow trenches is at a temperature from approximately  $900^\circ C$  to  
4 approximately  $1000^\circ C$ , at a pressure of from approximately 600 Torr to  
5 approximately 760 Torr, for a period of time from 60 minutes to 120  
6 minutes.